

Ultrasonic flowmeters for liquids for permanent installation in hazardous areas

Especially designed for the stationary use in explosive atmosphere

Features

- Instrument with one measuring channel for exact and reliable flow measurement
- Precise bidirectional and highly dynamic flow measurement with the non-invasive clamp-on technology
- High precision at fast and slow flow rates, high temperature and zero point stability
- Transmitter housing:
 - Robust and non-corrosive
 - Transmitter F808**-A1 in a flameproof housing (degree of protection IP66)
 - Transmitter F808**-F* in an explosionproof housing (NEMA 4X)
- Certification:
 - F808**-A1: ATEX/IECEEx
 - F808**-F1: FM Class I Div. 1
 - F808**-F2: FM Class I Div. 2
- The transmitter can be operated by a magnet pen without opening the housing
- Automatic loading of calibration data and transducer detection for a fast and easy set-up (less than 5 min), providing precise and long-term stable results
- User-friendly design
- Communication interfaces Modbus RTU and HART available
- Transducers available for a wide range of inner pipe diameters and fluid temperatures (-328 to +1112 °F)
- ATEX/IECEEx, FM Class I Div. 1/Div. 2 approved transducers for hazardous areas available
- HybridTrek automatically switches between transit time and NoiseTrek mode of measurement when high particulate flows are encountered
- Measurement is unaffected by fluid density, viscosity and solid content (max. 10 % of volume)
- Product variant FLUXUS XLF is especially suited for precise and reliable flow measurement applications with very low flow velocities (e.g. chemical injection in oil and gas extraction)

Applications

Designed for industrial use in harsh environments, especially for oil extraction and processing in the petrochemical and chemical industry.

- Chemical industry
- Petrochemical industry
- Oil extraction and exploration
- Refineries



FLUXUS F808



PermaRail



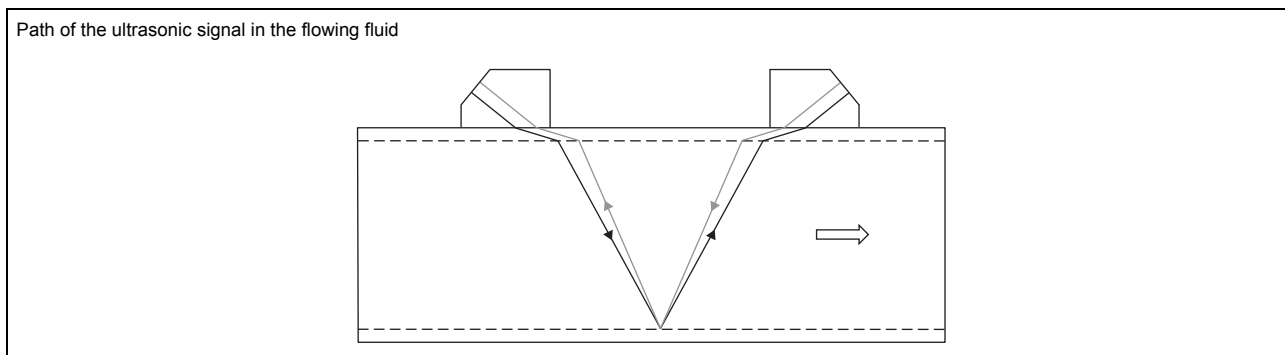
PermaFiX

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Function

Measurement principle

The transducers are mounted on the pipe which is completely filled with the fluid. The ultrasonic signals are emitted alternately by a transducer and received by the other. The physical quantities are determined from the transit times of the ultrasonic signals.

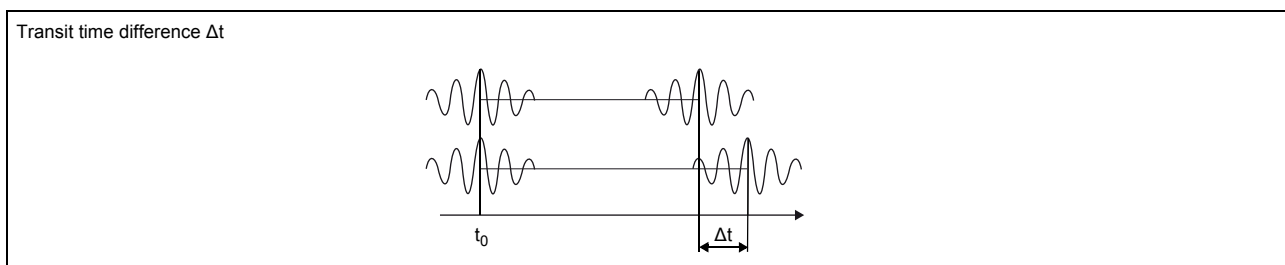


Transit time difference principle

As the fluid where the ultrasound propagates is flowing, the transit time of the ultrasonic signal in flow direction is shorter than the one against the flow direction.

The transit time difference Δt is measured and allows the flowmeter to determine the average flow velocity along the propagation path of the ultrasonic signals. A flow profile correction is then performed in order to obtain the area averaged flow velocity, which is proportional to the volumetric flow rate.

The integrated microprocessors control the entire measuring cycle. The received ultrasonic signals are checked for measurement usability and evaluated for their reliability. Noise signals are eliminated.



HybridTrek

If the gaseous or solid content in the fluid increases occasionally during measurement, a measurement with the transit time difference principle may no longer be possible. NoiseTrek mode will then be selected by the flowmeter. This measurement method allows the flowmeter to achieve a stable measurement even with high gaseous or solid content.

The transmitter can switch automatically between transit time and NoiseTrek mode without any changes to the measurement setup.

$$\dot{V} = k_{Re} \cdot A \cdot k_a \cdot \frac{\Delta t}{2 \cdot t_y}$$

where

- $\dot{V}$ - volumetric flow rate
- k_{Re} - fluid mechanics calibration factor
- A - cross-sectional pipe area
- k_a - acoustical calibration factor
- Δt - transit time difference
- t_y - average of transit times in the fluid

Number of sound paths

The number of sound paths is the number of transits of the ultrasonic signal through the fluid in the pipe. Depending on the number of sound paths, the following methods of installation exist:

- **reflect arrangement**

The number of sound paths is even. The transducers are mounted on the same side of the pipe. Correct positioning of the transducers is easier.

- **diagonal arrangement**

The number of sound paths is odd. The transducers are mounted on opposite sides of the pipe.

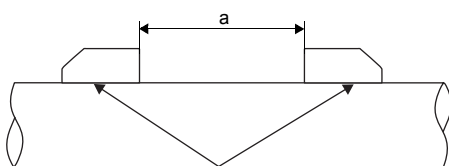
- **direct mode**

Diagonal arrangement with 1 sound path. This should be used in the case of a high signal attenuation by the fluid, pipe or coatings.

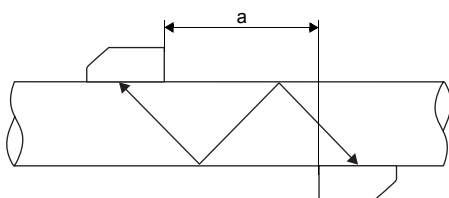
The preferred method of installation depends on the application. While increasing the number of sound paths increases the accuracy of the measurement, signal attenuation increases as well. The optimum number of sound paths for the parameters of the application will be determined automatically by the transmitter.

As the transducers can be mounted with the transducer mounting fixture in reflect arrangement or diagonal arrangement, the number of sound paths can be adjusted optimally for the application.

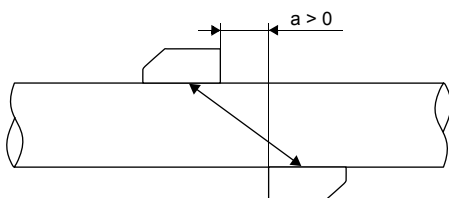
Reflect arrangement, number of sound paths: 2



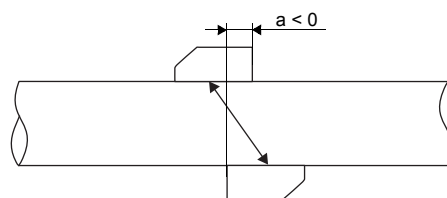
Diagonal arrangement, number of sound paths: 3



Direct mode, number of sound paths: 1



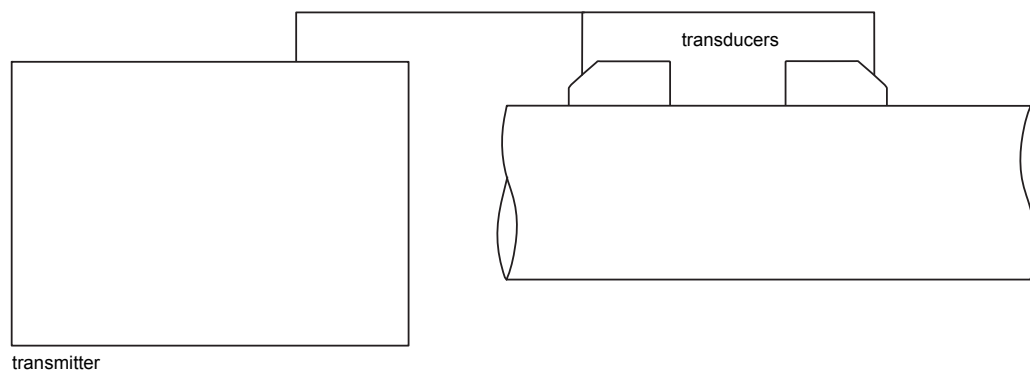
Direct mode, number of sound paths: 1, negative transducer distance



a - transducer distance

Typical measurement setup

Example of a reflect arrangement



Transmitter

Technical data

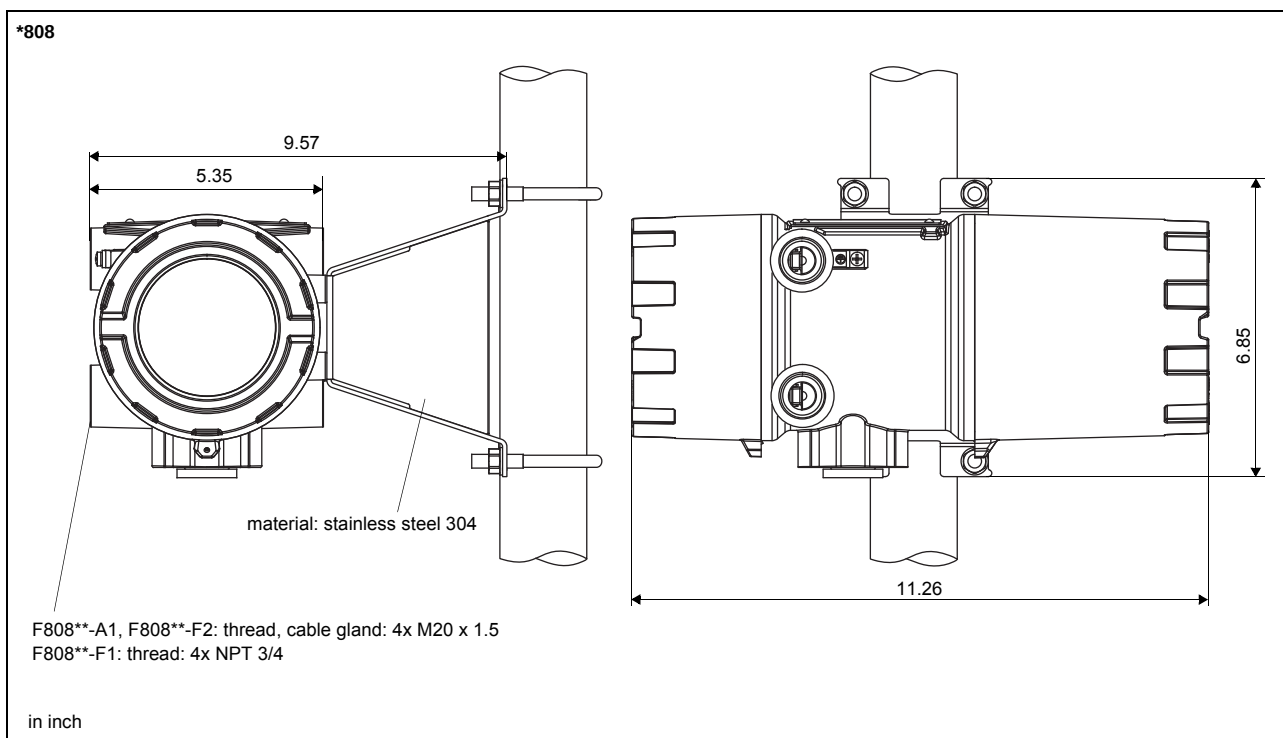
		FLUXUS F808**-A1	FLUXUS F808**-F1	FLUXUS F808**-F2
				
design		explosion proof field device 1 measuring channel zone 1	explosion proof field device 1 measuring channel FM Class I Div. 1	explosion proof field device 1 measuring channel FM Class I Div. 2
transducers		C****81, C****LI1, C***2E85	C**1N62	C****52
supported transducer frequencies		K, M, P, Q on request: G	K, M, P, Q on request: G	K, M, P, Q, S on request: G
measurement				
measurement principle		transit time difference correlation principle, automatic NoiseTrek selection for measurements with high gaseous or solid content		
flow velocity	ft/s	0.03 to 82		
repeatability		0.15 % of reading ±0.02 ft/s		
fluid		all acoustically conductive liquids with < 10 % gaseous or solid content in volume (transit time difference principle)		
temperature compensation		corresponding to the recommendations in ANSI/ASME MFC-5.1-2011		
measurement uncertainty (volumetric flow rate)				
measurement uncertainty of measuring system ¹		±0.3 % of reading ±0.02 ft/s includes calibration certificate traceable to NIST calibration facility ISO 17025 accredited		
measurement uncertainty at the measuring point ²		±1 % of reading ±0.02 ft/s		
transmitter				
power supply		• 100 to 230 V/50 to 60 Hz or • 20 to 32 V DC		
power consumption	W	< 8		
number of measuring channels		1		
damping	s	0 to 100 (adjustable)		
measuring cycle	Hz	100 to 1000		
response time	s	1, option: 0.07		
housing material		cast aluminum, special heavy-duty coating		
degree of protection		IP66		
dimensions	in	see dimensional drawing		
weight	lb	11		
fixation		wall mounting, 2" pipe mounting		
ambient temperature	°F	-22 to +140 (< -4 °F without operation of the display)	-13 to +140 (< -4 °F without operation of the display)	
display		2 x 16 characters, dot matrix, backlight		
menu language		English, German, French, Dutch, Spanish		
explosion protection				
• ATEX/IECEX				
marking		CE 0637 II2G II2D Ex db eb IIC T6 Gb Ex tb IIIC T100 °C Db T _a -40...+60 °C	-	-
certification ATEX		IBExU11ATEX1022 X	-	-
certification IECEX		IECEX IBE 11.0006X	-	-
• FM				
marking		-	 Cl. I, II, III/Div. 1/ GP. A, B, C, D, E, F, G/ For Group A, conduit seal of connection compartment is required within 18 inches.  Cl. I, II, III/Div. 1/ GP. B, C, D, E, F, G T5 Ta = 60 °C	 Cl. I,II,III/Div. 2/ GP. A,B,C,D,E,F,G/ T5 Ta = 60 °C

¹ with aperture calibration of the transducers² for transit time difference principle and reference conditions³ connection of the interface RS232 outside of explosive atmosphere (housing cover open)

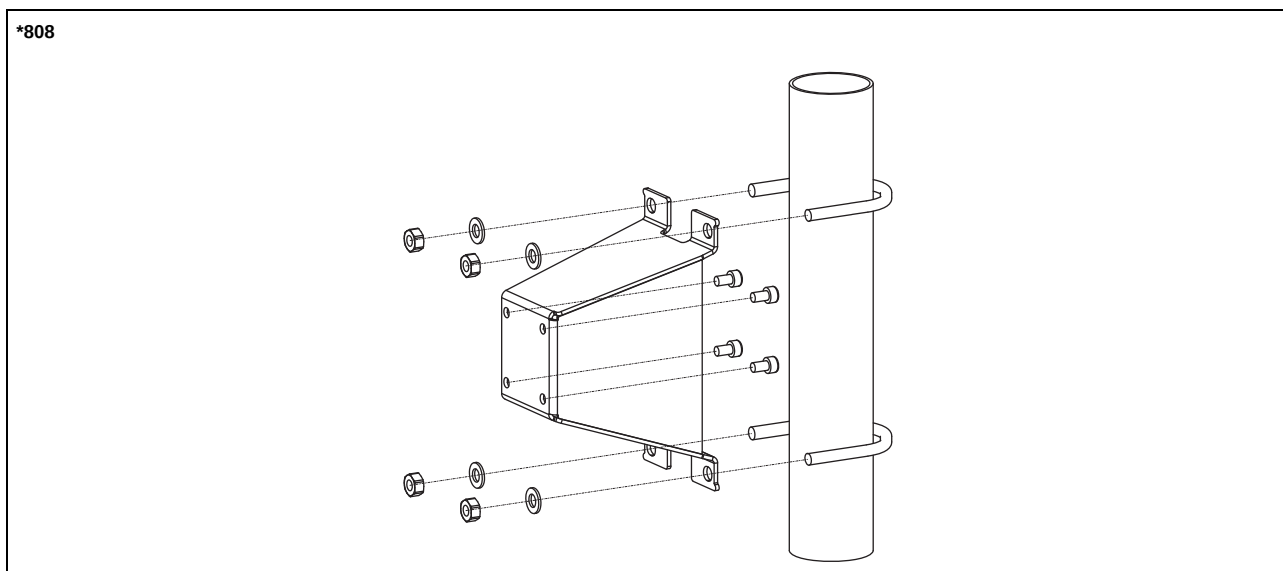
		FLUXUS F808**-A1	FLUXUS F808**-F1	FLUXUS F808**-F2
measuring functions				
physical quantities		volumetric flow rate, mass flow rate, flow velocity		
totalizer		volume, mass		
diagnostic functions		sound speed, signal amplitude, SNR, SCNR, standard deviation of amplitudes and transit times		
communication interfaces				
service interfaces		• RS232³ • USB (with adapter)³		
process interfaces		max. 1 option: • RS485 (ASCII sender) • Modbus RTU • HART	max. 1 option: • RS485 (ASCII sender) • Modbus RTU	
accessories				
serial data kit • cable • adapter		RS232 RS232 - USB		
software		• FluxDiagReader: download of measured values and parameters, graphical presentation • FluxDiag (optional): download of measurement data, graphical presentation, report generation • FluxSubstanceLoader: upload of fluid data sets		
data logger				
loggable values		all physical quantities, totaled values and diagnostic values		
capacity		> 100 000 measured values		
outputs				
		The outputs are galvanically isolated from the transmitter.		
number		• current output: 1 • binary output: 1 or • current output: 1 • Modbus or • current output: 1/HART • binary output: 1	• current output: 1 • binary output: 1 or • current output: 1 • Modbus	
• current output				
range	mA	0/4 to 20		
accuracy		0.1 % of reading ±15 µA		
active output		R _{ext} < 500 Ω		
passive output		U _{ext} = 4 to 26.4 V, depending on R _{ext} (R _{ext} < 1 kΩ at 26.4 V)		
current output in HART mode				
• range	mA	4 to 20	-	
• active output		U _{int} = 24 V	-	
• passive output		U _{ext} = 7 to 30 V DC	-	
• binary output				
open collector		24 V/4 mA optional (in combination with HART only): • 30 V/100 mA or • 8.2 V DIN EN 60947-5-6 (NAMUR)	24 V/4 mA	
binary output as alarm output				
• functions		limit, change of flow direction or error		
binary output as pulse output				
• functions		mainly for totalizing		
• pulse value	units	0.01 to 1000		
• pulse width	ms	1 to 1000		

¹ with aperture calibration of the transducers² for transit time difference principle and reference conditions³ connection of the interface RS232 outside of explosive atmosphere (housing cover open)

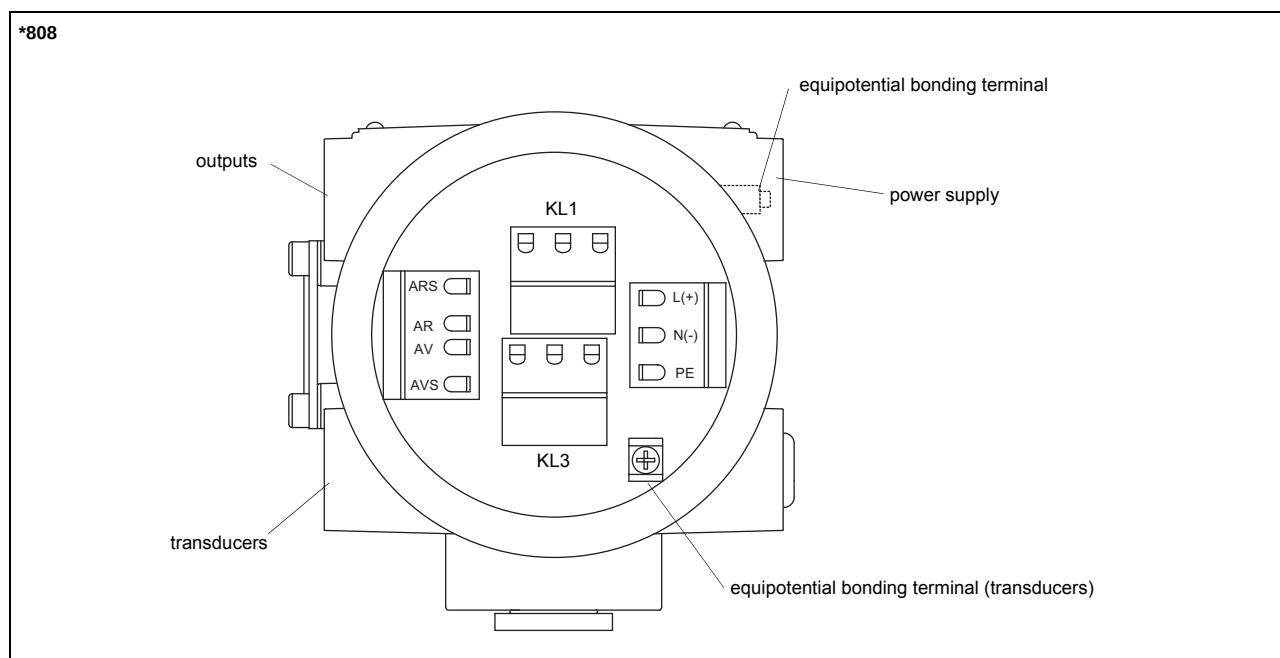
Dimensions



Wall and 2" pipe mounting kit



Terminal assignment



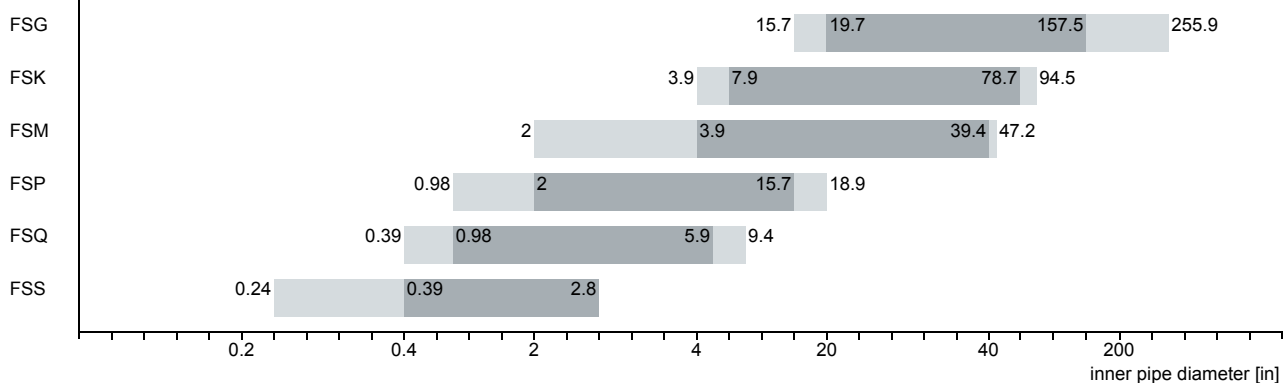
power supply ¹				
AC			DC	
terminal		connection	terminal	
L		phase	L+	
N		neutral	N-	
PE		earth	PE	
transducers, extension cable				
terminal		connection		transducer
ARS		internal shield		
AR		signal		
AV		signal		
AVS		internal shield		
cable gland or equipotential bonding terminal (transducers)		external shield		 
outputs (options) ¹				
terminal strip		terminal		connection
KL1		4 GND	6 (+)	5 (-)
KL3		3 GND	2 (+)	1 (-)
terminal strip		terminal		connection
KL1		4 GND	6 (+)	5 (-)
KL3		3 GND	1 (-)	2 (+)
terminal strip		terminal		connection
KL1		1 (S)	2 (A+)	3 (B-)
KL3		3 GND	2 (+)	1 (-)
terminal strip		terminal		connection
KL1		1 (S)	2 (A+)	3 (B-)
KL3		3 GND	1 (-)	2 (+)

¹ cable (by customer): e.g., flexible leads, with insulated wire end ferrules, lead cross sectional area: AWG14 to 24

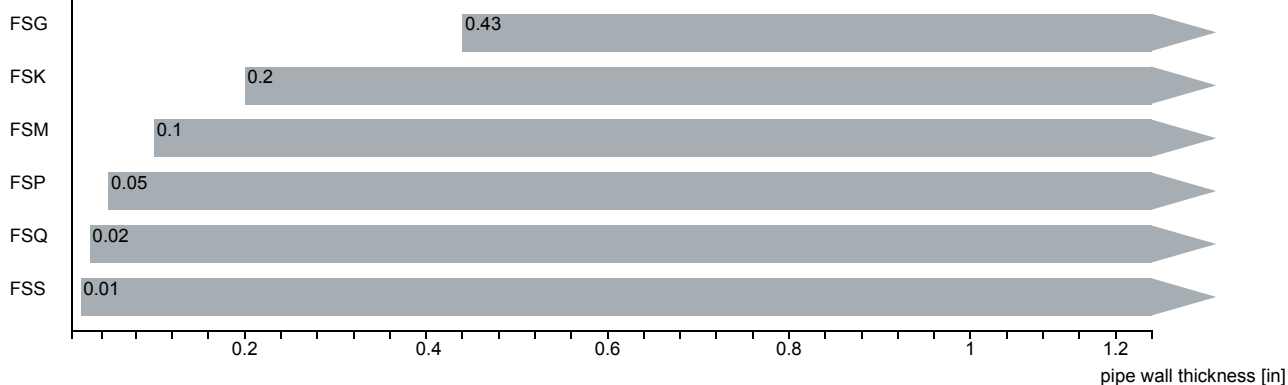
Transducers

Transducer selection

transducer order code



transducer order code



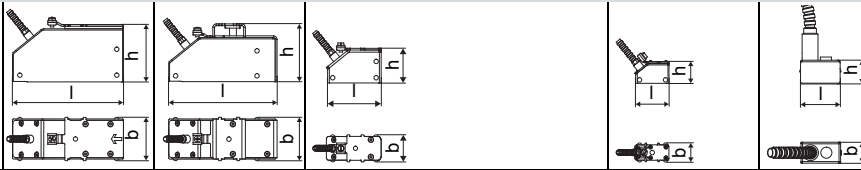
recommended possible

Transducer order code

1, 2	3	4	5, 6	7, 8	9 to 11	no. of character				
transducer	transducer frequency	-	ambient temperature	explosion protection	connection system	-	extension cable	/	option	description
FS										set of ultrasonic flow transducers for liquids measurement, shear wave
	G									0.2 MHz (on request)
	K									0.5 MHz
	M									1 MHz
	P									2 MHz
	Q									4 MHz
	S									8 MHz
		N								normal temperature range
		E								extended temperature range
			A1							ATEX zone 1/IECEX zone 1
			F2							FM Class I Div. 2
			F1							FM Class I Div. 1
				TS						direct connection or connection via junction box
					XXX					0 m: without extension cable > 0 m: with extension cable
								LC		long transducer cable
								IP68		degree of protection IP68
								OS		housing with stainless steel 316

Technical data

Shear wave transducers (FM Class I Div. 2, TS)

order code		FSG-N**TS/**	FSK-N**TS/**	FSM-N**TS/**	FSP-N**TS/**	FSQ-N**TS/**	FSS-N**TS/**
technical type		C(DL)G1N52	C(DL)K1N52	C(DL)M2N52	C(DL)P2N52	C(DL)Q2N52	CDS1N52
transducer frequency	MHz	0.2	0.5	1	2	4	8
inner pipe diameter d							
min. extended	in	15.7	3.9	2	0.98	0.39	0.24
min. recommended	in	19.7	7.9	3.9	2	0.98	0.39
max. recommended	in	157.5	78.7	39.4	15.7	5.9	2.8
max. extended	in	255.9	94.5	47.2	18.9	9.4	2.8
pipe wall thickness							
min.	in	0.43	0.2	0.1	0.05	0.02	0.01
material							
housing		PEEK with stainless steel cap 304, ***-*****/OS: 316L					stainless steel 304
contact surface		PEEK					PEI
degree of protection		NEMA 6					NEMA 4
transducer cable							
type		1699					
length	ft	16	13			9	6
length (***-*****/LC)	ft	29					-
dimensions							
length l	in	5.1	4.98	2.52		1.57	0.98
width b	in	2.01	2.01	1.26		0.87	0.51
height h	in	2.64	2.66	1.59		1	0.67
dimensional drawing							
weight (without cable)	lb	1	0.79	0.15		0.04	0.01
pipe surface temperature							
min.	°F	-40					-22
max.	°F	+266					+266
ambient temperature							
min.	°F	-40					-22
max.	°F	+266					+266
temperature compensation		x					-
explosion protection							
• FM							
order code		FSG-NF2TS/**	FSK-NF2TS/**	FSM-NF2TS/**	FSP-NF2TS/**	FSQ-NF2TS/**	FSS-NF2TS/**
pipe surface temperature (Ex)							
• min.	°F	-40					
• max.	°F	+257					+257
degree of protection		IP66					
marking		 NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860					
remark		on request					

Shear wave transducers (FM Class I Div. 2, TS, extended temperature range)

order code		FSM-E**TS/**	FSP-E**TS/**	FSQ-E**TS/**
technical type		C(DL)M2E52	C(DL)P2E52	C(DL)Q2E52
transducer frequency	MHz	1	2	4
inner pipe diameter d				
min. extended	in	2	0.98	0.39
min. recommended	in	3.9	2	0.98
max. recommended	in	39.4	15.7	5.9
max. extended	in	47.2	18.9	9.4
pipe wall thickness				
min.	in	0.1	0.05	0.02
material				
housing		PI with stainless steel cap 304, ***-*****/OS: 316L		
contact surface		PI		
degree of protection		NEMA 4		
transducer cable				
type		6111		
length	ft	13		9
length (**-*****/LC)	ft	29		
dimensions				
length l	in	2.52		1.57
width b	in	1.26		0.87
height h	in	1.59		1
dimensional drawing				
weight (without cable)	lb	0.15		0.04
pipe surface temperature				
min.	°F	-22		-22
max.	°F	+450 ¹		+392
ambient temperature				
min.	°F	-22		-22
max.	°F	+104 +140 ² +392 ³		+392
temperature compensation		x		
explosion protection				
• FM				
order code		FSM-EF2TS/**	FSP-EF2TS/**	FSQ-EF2TS/**
pipe surface temperature (Ex)				
• min.	°F	-40		
• max.	°F	+455 ¹		
degree of protection		IP66		
marking		 NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860		

¹ > +200 °C/+392 °F:

Variofix L (nonEx, Ex) or quick release clasps and tension straps (nonEx)

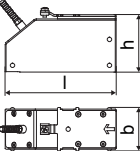
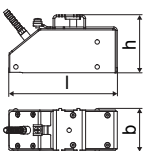
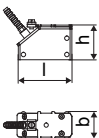
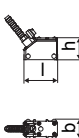
observe the insulation instruction

Ex: ambient temperature max. +104 °F

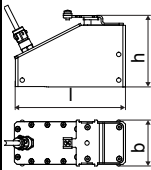
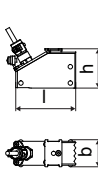
² pipe surface temperature +200 to +240 °C/+392 to +450 °F: quick release clasps and tension straps

³ pipe surface temperature max. +392 °F

Shear wave transducers (zone 1, TS)

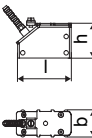
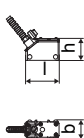
order code		FSG-N*1TS/**	FSK-N*1TS/**	FSM-N*1TS/**	FSP-N*1TS/**	FSQ-N*1TS/**
technical type		C(DL)G1N81	C(DL)K1N81	C(DL)M2N81	C(DL)P2N81	C(DL)Q2N81
transducer frequency	MHz	0.2	0.5	1	2	4
inner pipe diameter d						
min. extended	in	15.7	3.9	2	0.98	0.39
min. recommended	in	19.7	7.9	3.9	2	0.98
max. recommended	in	157.5	78.7	39.4	15.7	5.9
max. extended	in	255.9	94.5	47.2	18.9	9.4
pipe wall thickness						
min.	in	0.43	0.2	0.1	0.05	0.02
material						
housing		PEEK with stainless steel cap 304 , ***-*****/OS: 316L				
contact surface		PEEK				
degree of protection		IP65	IP66			IP65
transducer cable						
type		1699				
length	ft	16		13		9
length (***-*****/LC)	ft	29				
dimensions						
length l	in	5.1	4.98	2.52		1.57
width b	in	2.01	2.01	1.26		0.87
height h	in	2.64	2.66	1.59		1
dimensional drawing						
weight (without cable)	lb	1	0.79	0.15		0.04
pipe surface temperature						
min.	°F	-40				
max.	°F	+266				
ambient temperature						
min.	°F	-40				
max.	°F	+266				
temperature compensation		x				
explosion protection						
• ATEX/IECEx						
order code		FSG-NA1TS/**	FSK-NA1TS/**	FSM-NA1TS/**	FSP-NA1TS/**	FSQ-NA1TS/**
pipe surface temperature (Ex)						
• min.	°C	-55				
• max.	°C	+180				
marking		CE 0637 Ex II2G Ex q IIC T6...T3 Gb Ex tb IIIC TX Db				
certification ATEX		IBExU07ATEX1168 X				
certification IECEx		IECEx IBE 08.0007X				
remark		on request				

Shear wave transducers (zone 1, TS, IP68)

order code		FSG-N*1TS/IP68	FSK-N*1TS/IP68	FSM-N*1TS/IP68	FSP-N*1TS/IP68
technical type		CDG1LI1	CDK1LI1	CDM2LI1	CDP2LI1
transducer frequency	MHz	0.2	0.5	1	2
inner pipe diameter d					
min. extended	in	15.7	3.9	2	0.98
min. recommended	in	19.7	7.9	3.9	2
max. recommended	in	157.5	78.7	39.4	15.7
max. extended	in	255.9	94.5	47.2	18.9
pipe wall thickness					
min.	in	0.43	0.2	0.1	0.05
material					
housing		PEEK with stainless steel cap 316Ti			
contact surface		PEEK			
degree of protection		IP68 ¹			
transducer cable					
type		2550			
length	ft	39			
dimensions					
length l	in	5.12		2.76	
width b	in	2.13		1.26	
height h	in	3.29		1.81	
dimensional drawing					
weight (without cable)	lb	0.95		0.19	
pipe surface temperature					
min.	°F	-40			
max.	°F	+212			
ambient temperature					
min.	°F	-40			
max.	°F	+212			
temperature compensation		x			
explosion protection					
• ATEX/IECEx					
order code		FSG-NA1TS/IP68	FSK-NA1TS/IP68	FSM-NA1TS/IP68	FSP-NA1TS/IP68
pipe surface temperature (Ex)					
• min.	°C	-55			
• max.	°C	+80			
marking		CE0637 Ex II2G II2D Ex q IIC T6...T3 Gb Ex tb IIIC TX Db			
certification ATEX		IBExU07ATEX1168 X			
certification IECEx		IECEx IBE 08.0007X			
remark		on request			

¹ test conditions: 3 months/29 psi (65 ft)/36 °F

Shear wave transducers (zone 1, TS, extended temperature range)

order code		FSM-E*1TS/**	FSP-E*1TS/**	FSQ-E*1TS/**
technical type		C(DL)M2E85	C(DL)P2E85	C(DL)Q2E85
transducer frequency	MHz	1	2	4
inner pipe diameter d				
min. extended	in	2	0.98	0.39
min. recommended	in	3.9	2	0.98
max. recommended	in	39.4	15.7	5.9
max. extended	in	47.2	18.9	9.4
pipe wall thickness				
min.	in	0.1	0.05	0.02
material				
housing		PI with stainless steel cap 304, ***-****/OS: 316L		
contact surface		PI		
degree of protection		IP66		IP56
transducer cable				
type		6111		
length	ft	13		9
length (***-*****/LC)	ft	29		
dimensions				
length l	in	2.52		1.57
width b	in	1.26		0.87
height h	in	1.59		1
dimensional drawing				
weight (without cable)	lb	0.15		0.04
pipe surface temperature				
min.	°F	-22		-22
max.	°F	+450 ¹		+392
ambient temperature				
min.	°F	-22		-22
max.	°F	+104 +392 ²		+392
temperature compensation		x		
explosion protection				
• ATEX/IECEx				
order code		FSM-EA1TS/**	FSP-EA1TS/**	FSQ-EA1TS/**
pipe surface temperature (Ex)				
• min.	°C	-45		
• max.	°C	+225 ¹		
marking		CE 0637 Ex II 2G II 2D Ex q IIC T6...T2 Gb Ex tb IIIA TX Db		
certification ATEX		IBExU07ATEX1168 X		
certification IECEx		IECEx IBE 08.0007X		

¹ > +200 °C/+392 °F:

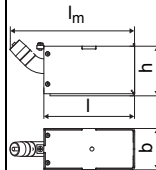
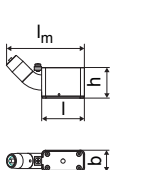
Variotix L

observe the insulation instruction

ambient temperature max. +40 °C/+104 °F

² pipe surface temperature max. +200 °C/+392 °F

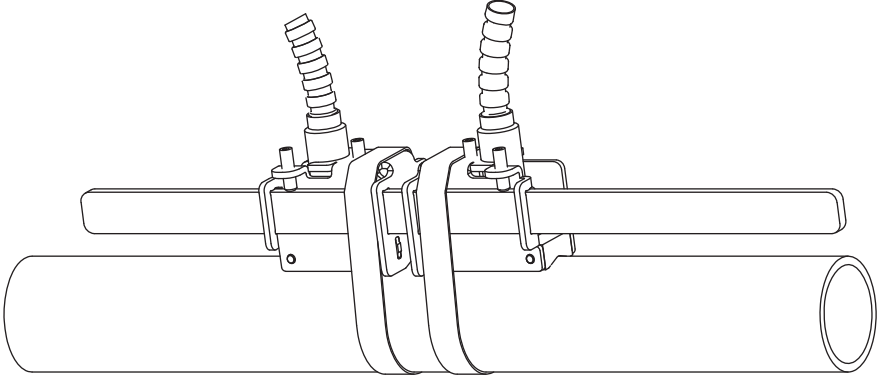
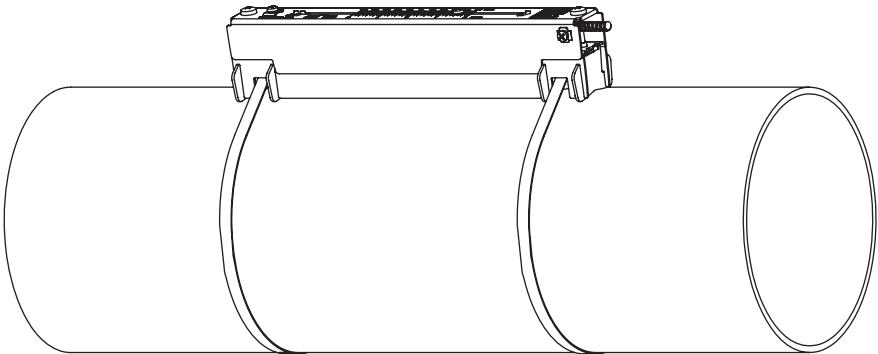
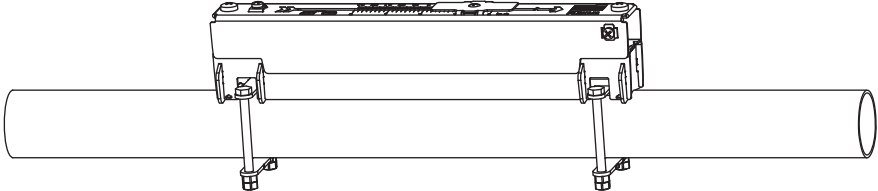
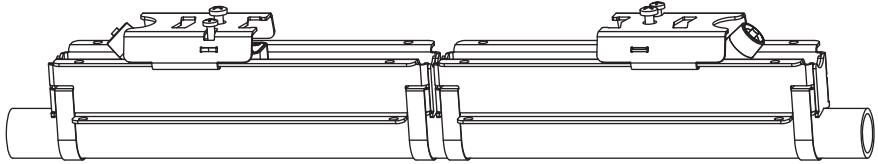
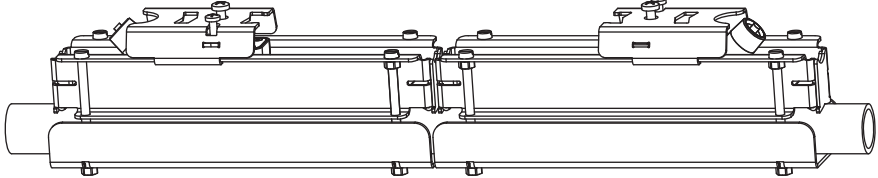
Shear wave transducers (FM Class I Div. 1, TS)

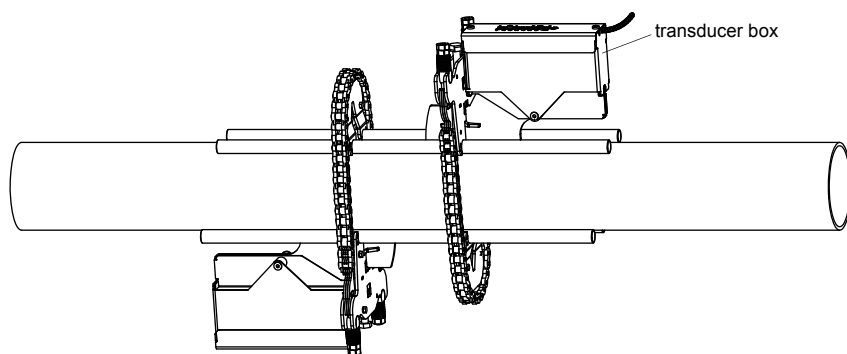
order code		FSG-NF1TS/**	FSK-NF1TS/**	FSM-NF1TS/**	FSP-NF1TS/**	FSQ-NF1TS/**
technical type		C(DL)G1N62	C(DL)K1N62	C(DL)M1N62	C(DL)P1N62	C(DL)Q1N62
transducer frequency	MHz	0.2	0.5	1	2	4
inner pipe diameter d						
min. extended	in	15.7	3.9	2	0.98	0.39
min. recommended	in	19.7	7.9	3.9	2	0.98
max. recommended	in	157.5	78.7	39.4	15.7	5.9
max. extended	in	255.9	94.5	47.2	18.9	9.4
pipe wall thickness						
min.	in	0.43	0.2	0.1	0.05	0.02
material						
housing		stainless steel 304, ***-****/OS: 316L				
contact surface		PEEK				
degree of protection		IP66				
transducer cable						
type		2549				
length	ft	32				
length (**-****/LC)	ft	150				
dimensions						
length l	in	5.2		2.36		
width b	in	2.36		1.18		
height h	in	2.83		1.69		
mounting length l _m	in	7.28		4.33		
dimensional drawing						
weight (without cable)	lb	2.4		0.63		
pipe surface temperature						
min.	°F	-40				
max.	°F	+230				
ambient temperature						
min.	°F	-40				
max.	°F	+230				
temperature compensation		x				
explosion protection						
• FM						
order code		FSG-NF1TS/**	FSK-NF1TS/**	FSM-NF1TS/**	FSP-NF1TS/**	FSQ-NF1TS/**
pipe surface temperature (Ex)						
• min.	°F	-40				
• max.	°F	+257				
marking		S/Cl. I, II, III / Div. 1 / GP A, B, C, D, E, F, G / Temperature Codes dwg 3831				
remark		on request				

Transducer mounting fixture

Order code

1, 2	3	4	5	6	7 to 9	no. of character
transducer mounting fixture	transducer	measurement arrangement	size	fixation	outer pipe diameter	description
VL						PermaRail
PF						PermaFiX
WI						transducer box for WaveInjector
	K					transducers with transducer frequency G, K
	M					transducers with transducer frequency M, P, Q
	Q					transducers with transducer frequency Q
	S					transducers with transducer frequency S
		D				reflect arrangement or diagonal arrangement/direct mode
		R				reflect arrangement
			S			small
			M			medium
			L			large
				B		bolts
				S		tension straps
				W		welding
				N		without fixation
					002	0.39 to 0.79 in
					004	0.79 to 1.6 in
					T36	1.6 to 14.2 in
					013	0.39 to 5.1 in
					036	5.1 to 14.2 in
					092	14.2 to 36.2 in
					200	36.2 to 78.7 in
					450	78.7 to 177.2 in
					940	177.2 to 370.1 in
					SK1	0.5 to 2.5 in
					SK2	3 to 6 in
					SK3	8 to 10 in
					SK4	12 to 18 in
					SK5	20 to 36 in
					SK6	42 to 100 in
					SK7	100 to 170 in
					SB2	3 to 6 in
					SB3	8 to 10 in
					SB4	12 to 18 in
					SB5	20 to 36 in
					SB6	30 to 100 in
					NDR	any
						IP68 for transducers with degree of protection IP68
						OS housing with stainless steel 316
						Z special design

PermaRail (VLS) 	transducer frequency: S material: stainless steel 304, 303
PermaRail (VLK, VLM, VLQ) 	material: stainless steel 304, 301, 410 option OS: 316Ti, 316L, 17-7PH inner length: VLK: 13.7 in, option IP68: 14.5 in VLM: 9.2 in VLQ: 6.9 in dimensions: VLK: 16.65 x 3.54 x 3.66 in option IP68: 17.44 x 3.7 x 4.13 in VLM: 12.17 x 2.24 x 2.48 in VLQ: 9.72 x 1.69 x 1.85 in
PermaRail with bolt mounting plates (VL*-**-B) 	material: stainless steel 304, 301, 410 option OS: 316Ti, 316L, 17-7PH inner length: VLM: 9.2 in VLQ: 6.9 in dimensions: VLM: 12.17 x 2.24 x 2.48 in VLQ: 9.72 x 1.69 x 1.85 in outer pipe diameter: max. 1.9 in
PermaFix • with tension straps (PF*-DS-S)  • with bolts (PF*-DS-B) 	material: stainless steel 304, 301 option OS: 316Ti inner length: PFK: 14.69 in PFM: 10.87 in dimensions: PFK: 16.14 x 3.54 x 2.87 in PFM: 12.2 x 2.68 x 1.73 in

transducer box WI for WaveInjector

see Technical specification
TSWaveInjectorVx-x

Coupling materials for transducers

	normal temperature range (4th character of transducer order code = N)		extended temperature range (4th character of transducer order code = E)			WaveInjector WI-400	
	< 212 °F	< 338 °F	< 302 °F	< 392 °F	392 to 464 °F	< 536 °F	536 to 752 °F
< 24 h	coupling compound type N or coupling pad type VT	coupling compound type E or coupling pad type VT	coupling compound type E or coupling pad type VT	coupling compound type E or H or coupling pad type VT	coupling pad type TF	coupling pad type A and coupling pad type VT	coupling pad type B and coupling pad type VT
long time measurement	coupling pad type VT ¹	coupling pad type VT ²	coupling pad type VT ¹	coupling pad type VT ²	coupling pad type TF	coupling pad type A and coupling pad type VT	coupling pad type B and coupling pad type VT

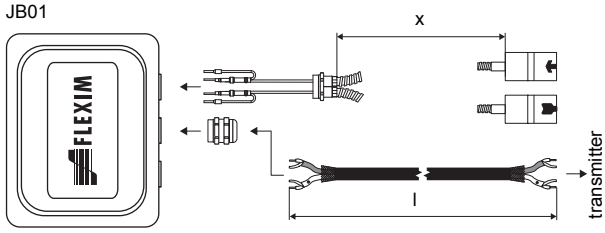
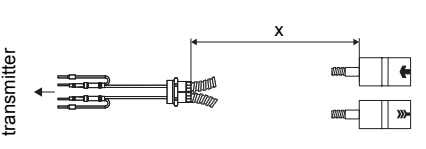
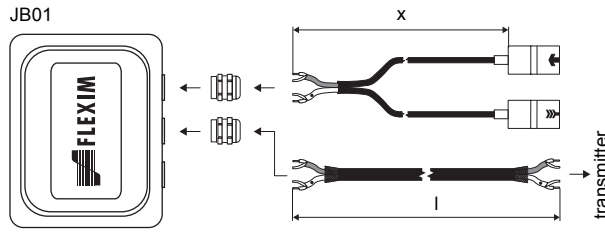
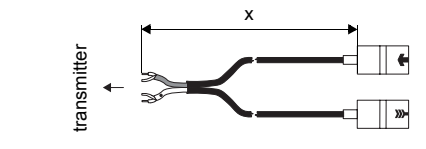
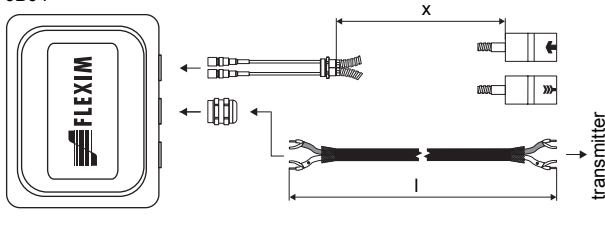
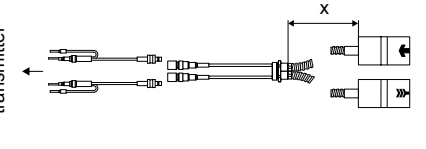
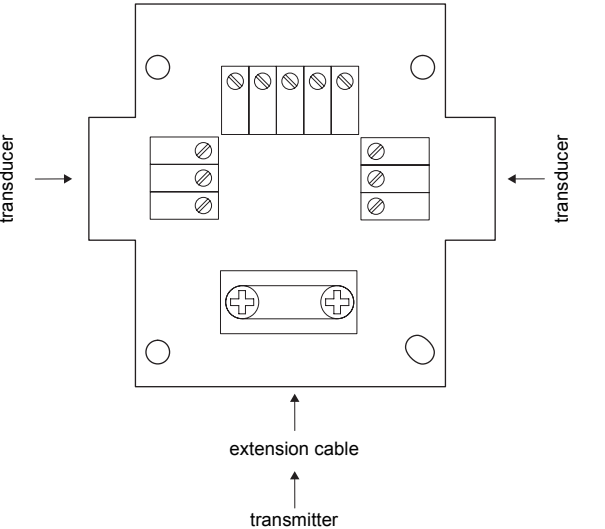
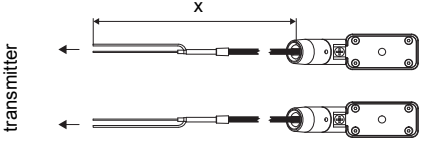
¹ < 5 years

² < 6 months

Technical data

type	ambient temperature °F
coupling compound type N	-22 to +266
coupling compound type E	-22 to +392
coupling compound type H	-22 to +482
coupling pad type A	max. 536
coupling pad type B	536 to 752
coupling pad type VT	14 to +392
coupling pad type TF	392 to 464

Connection systems

connection system TS		
connection with extension cable	direct connection	transducers technical type
JB01 		*****8*
JB01 		****L*
JB04 		*****52
terminal board for junction box KFM1 (junction box by customer) 		*****62

Cable

transducer cable					
type		1699	2550	6111	2549
weight	lb/ft	0.06	0.02	0.06	0.04
ambient temperature	°F	-67 to +392	-40 to +212	-148 to +437	-148...+392
properties			longitudinal watertight		
cable jacket					
material		PTFE	PUR	PFA	PTFE
outer diameter	in	0.11	0.2 ±0.01	0.11	0.21
thickness	in	0.01	0.04	0.02	0.02
color		brown	gray	white	black
shield		x	x	x	x
sheath					
material		stainless steel 304 option OS: 316Ti	-	stainless steel 304 option OS: 316Ti	-
outer diameter	in	0.31	-	0.31	-

extension cable			
type		2615	5245
weight	lb/ft	0.12	0.26
ambient temperature	°F	-22 to +158	-22 to +158
properties		halogen free fire propagation test according to IEC 60332-1 combustion test according to IEC 60754-2	halogen free fire propagation test according to IEC 60332-1 combustion test according to IEC 60754-2
cable jacket			
material		PUR	PUR
outer diameter	in	0.47	0.47
thickness	in	0.08	0.08
color		black	black
shield		x	x
sheath			
material		-	steel wire braid with copolymer sheath
outer diameter	in	-	0.61

Cable length

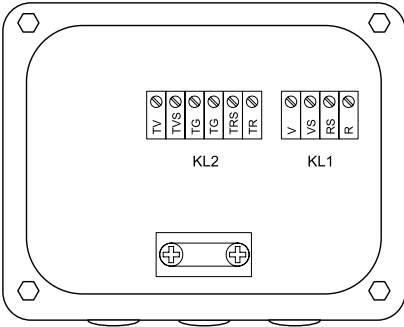
transducer frequency		F, G, H, K		M, P		Q		S	
connection system TS									
transducers technical type		x	l	x	l	x	l	x	l
*(DR)***8*	ft	16	≤ 984	13	≤ 984	9	≤ 295	-	-
option LC: *(LT)***8*	ft	29	≤ 984	29	≤ 984	29	≤ 295	-	-
*(DR)***5*	ft	16	≤ 984	13	≤ 984	9	≤ 295	6	≤ 131
option LC: *(LT)***5*	ft	29	≤ 984	29	≤ 984	29	≤ 295	-	-
*(DR)***62	ft	32	≤ 984	32	≤ 984	32	≤ 295	-	-
option LC: *(LT)***62	ft	150	≤ 984	150	≤ 984	150	≤ 295	-	-
option IP68: **** *	ft	39	≤ 984	39	≤ 984	-	-	-	-

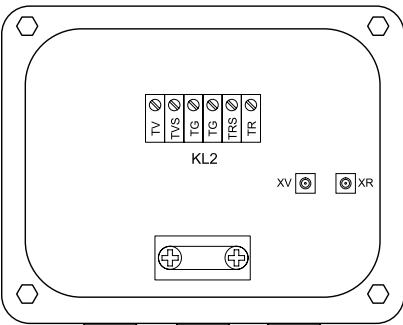
x = transducer cable length

l = max. length of extension cable (depending on application)

Junction box (F808**-A1, F808**-F2)

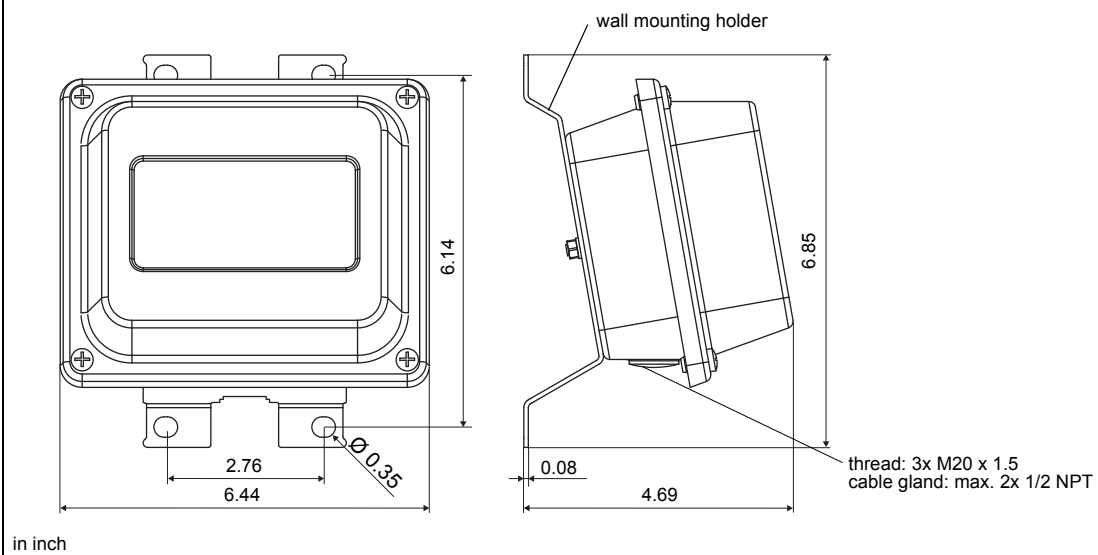
Technical data

JB01S4E3M			
weight	lb	2.6 lb	
transmitter		F808**-A1	
fixation		wall mounting optional: 2" pipe mounting	
material			
housing		stainless steel 316L	
gasket		silicone	
degree of protection		IP67	
ambient temperature			
min.	°F	-40	
max.	°F	+176	
explosion protection			
• ATEX/IECEX			
marking		CE0637 Ex II2G II2D Ex eb mb IIC T6...T4 Gb Ex tb IIIC T100 °C Db Ta -40...+70/80 °C	
certification ATEX		IBExU06ATEX1161	
certification IECEx		IECEX IBE 08.0006	
type of protection		gas: increased safety decoupled network: encapsulation dust: protection by enclosure	
connection			
			
transducers			
terminal strip	terminal	connection	transducer
KL1	V	signal	↑
	VS	internal shield	
	RS	internal shield	⤴
	R	signal	
extension cable			
terminal strip	terminal	connection	
KL2	TV	signal	
	TVS	internal shield	
	TRS	internal shield	
	TR	signal	

JB04			
weight	lb	2.6 lb	
transmitter		F808**-F2	
fixation		wall mounting optional: 2" pipe mounting	
material			
housing		stainless steel 316L	
gasket		silicone	
degree of protection		IP67	
ambient temperature			
min.	°F	-40	
max.	°F	+176	
• FM			
marking		FM APPROVED NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ T6 Ta = -40...+60 °C	
connection			
			
transducers			
	terminal	connection	transducer
	XV	SMB connector	↑
	XR	SMB connector	⤴
extension cable			
terminal strip	terminal	connection	
KL2	TV	signal	
	TVS	internal shield	
	TRS	internal shield	
	TR	signal	

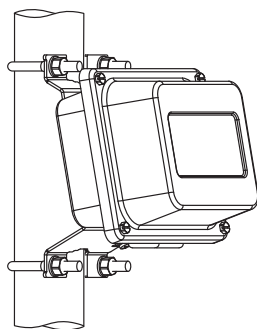
Dimensions

JB0*, JBP*



2" pipe mounting kit

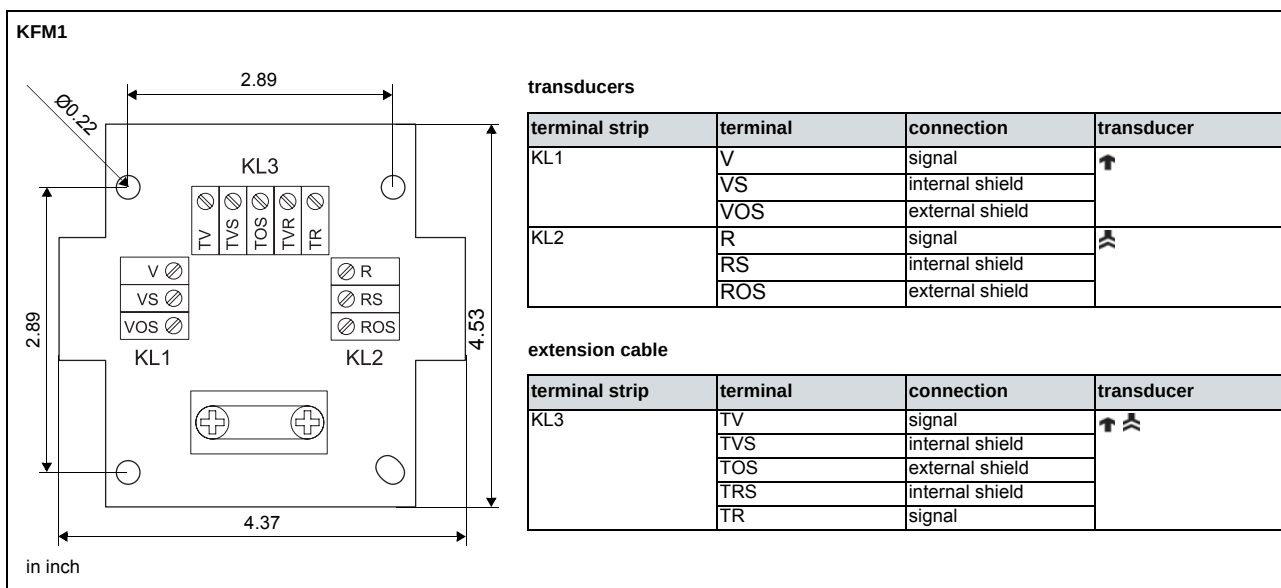
JB**



Extension cable (F808**-F1)

The extension cable and the transducers are connected via terminal board KFM1. The terminal board has to be installed into a junction box (by customer) approved for hazardous areas.

Terminal assignment KFM1



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